

CALIFORNIA STATE UNIVERSITY, SACRAMENTO  
Department of Mathematics and Statistics

SYLLABUS

Math 45: Differential Equations

Prerequisites: Math 31

This course provides an introduction to differential equations and their applications to the sciences for students majoring in Mathematics, Science, Engineering, and Computer Science.

OUTLINE:

I. Introduction 1 Week

- a. Definitions and vocabulary
- b. Questions of existence and uniqueness
- c. Geometric representation

II. First order differential equations 3 Weeks

- a. Separable
- b. Homogeneous
- c. Exact
- d. Linear
- e. Miscellaneous - Including Bernoulli's equation

III. Higher order differential equations 3 Weeks

- a. Linear dependence - independence
- b. General solution
- c. Reduction of order
- d. Linear equations with constant coefficients
- e. Method of undetermined coefficients
- f. Method of variation of parameters
- g. Cauchy-Euler equation

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|---------------------------------------|---------|
| IV. Laplace transform                 | 3 Weeks |
| a. Definition                         |         |
| b. Properties                         |         |
| c. Inverse transform                  |         |
| d. Solution of differential equations |         |
| V. Systems of differential equations  | 1 Week  |
| a. Reduction to triangular form       |         |
| b. Laplace transform method           |         |
| VI. Applications - Selected from *    | 3 Weeks |
| a. Growth and decay                   |         |
| b. Harmonic oscillator                |         |
| c. Mechanical systems                 |         |
| d. Electrical systems                 |         |

\*Instructors are expected to introduce applications throughout the course, particularly in the coverage of sections II, III, and V.